

Customer No.: 31561
Application No.: 10/709,055
Docket No.: 12404-US-PA

REMARKS

Present Status of the Application

This is a full and timely response to the outstanding non-final Office Action mailed on August 9, 2007. The Office Action maintains the rejections to claims 1-5 and 12 under 35 U.S.C. 103(a), as being unpatentable over Yamazaki et al. (USPAP 2002/0004292, hereinafter Yamazaki) in view of Tanabe et al. (USPN 6,861,614, hereinafter Tanabe), and to claims 6-11 and 13-17 under 35 U.S.C. 103(a) as being unpatentable over Yamazaki and Tanabe in view of Jung (USPN 6,825,493, hereinafter Jung). Upon entry of this response, claims 1-17 remain pending.

Applicant has most respectfully considered the remarks set forth in this Office Action. Regarding the obviousness rejections, it is however strongly believed that the cited references are deficient to adequately teach the claimed features as recited in the currently pending claims. The reasons that motivate the above position of the Applicant are discussed in detail hereafter, upon which reconsideration of the claims is most earnestly solicited.

Discussion of Office Action Rejections

The Office Action has rejected claims 1-5 and 12 under 35 U.S.C. 103(a) as being unpatentable over Yamazaki (USP 2002/0004292) in view of Tanabe (USP 6,861,614).

Applicants respectfully submits that the Office has failed to establish the prima facie obviousness in rejecting independent Claims 1 and 13 because Yamazaki and Tanabe, taken

Customer No.: 31561
Application No.: 10/709,055
Docket No.: 12404-US-PA

alone or combined, fails to teach or suggest, among other things, an apparatus for laser annealing an amorphous silicon film comprising "a first photomask disposed on an optical path of said first laser beam and in front of said amorphous silicon film, the first photomask comprising a first pattern having a transparent region and a non-transparent region and a second photomask disposed on an optical path of said second laser beam and in front of said amorphous silicon film, the second photomask comprising a second pattern having a transparent region and a non-transparent region, wherein the transparent region and the non-transparent region of the first pattern is substantially aligned with the non-transparent region and transparent region of the second pattern, respectively" as substantially recited in Claims 1 and 13.

As previously discussed, the present invention teaches that both the first and second laser beams are irradiating to the front of the amorphous silicon film, while Yamazaki teaches irradiating the laser light to the front and the back of a film (see Figures 3, 5 and 6). Further, not only Yamazaki fails to disclose the application of a photomask, Yamazaki fails to teach or suggest the application of two photomasks concurrently. More particularly, Yamazaki fails to teach or suggest the first photomask comprises a first pattern having a transparent region and a non-transparent region and the second photomask comprises a second pattern having a transparent region and a non-transparent region, and the transparent region and the non-transparent region of the first pattern is substantially aligned with the non-transparent region and transparent region of the second pattern.

Customer No.: 31561
Application No.: 10/709,055
Docket No.: 12404-US-PA

The Office, nevertheless, maintains the assertion that Tanabe discloses a system for modifying thin silicon films and an application of a photomask to project light pattern, and thus concludes that it would have been obvious at the time of the invention to use a photomask in the optical path as taught by Tanabe in the Yamazaki's system. The Office further argues the duplication of parts was held to have been obvious. Applicant respectfully disagrees.

Assuming that a photomask can be placed on the optical path(s) of Yamazaki's system as asserted by the Office, according to the teachings of Yamazaki, a first photomask must be placed in the front of the silicon film and a second photomask must be placed in the back of the silicon film. However, where exactly the second photomask can be placed in Yamazaki's system to achieve the claimed effect of the invention is highly questionable. Further, according to the present invention, the first photomask must comprises a first pattern having a transparent region and a non-transparent region and the second photomask comprises a second pattern having a transparent region and a non-transparent region, and the transparent region and the non-transparent region of the first pattern are substantially aligned with the non-transparent region and transparent region of the second pattern. First of all, Yamazaki teaches in [0060] to [0061] the use of linearized laser light to make it possible to irradiate a large area at once with the laser light, for example, the entire front side of the amorphous semiconductor film or the entire back side of the amorphous semiconductor film (as shown in Figure 3). Hence, the motivation to modify Yamazaki and to combine with a teaching of a photomask(s) with the patterns having non-transparent regions to irradiate only sectional regions of a surface as taught

Customer No.: 31561
Application No.: 10/709,055
Docket No.: 12404-US-PA

in the present invention is lacking. In fact, the combination of Yamazaki's system with a photomask(s) with patterns having non-transparent regions will defeat Yamazaki's purpose of irradiating "a large area at once". Additionally, Yamazaki teaches in [0012] that the front side and the back side of a semiconductor film are irradiated with laser light generated and emitted from a solid state laser (a laser that outputs laser light using a crystal rod as a resonance cavity) as a source, and in [0200] that a laser annealing is conducted by irradiating both the front side and the back side of the amorphous semiconductor film with laser light makes it possible to obtain a crystalline semiconductor film with a larger crystal grain size as compared to prior art (where only the front side of the amorphous semiconductor film is irradiated with laser light). The obtainment of the crystalline semiconductor film with a larger crystal grain size further can lead to a great improvement of the ability of a semiconductor device.) In essence, Yamazaki teaches the irradiation of both sides of the amorphous semiconductor is preferred over the irradiation of one side of the film. Hence, Yamazaki's teaching is directed to the irradiation of both sides of the film and teaches away the claimed invention of irradiation a single side of the film. As stated in MPEP §2143.01, "the proposed modification cannot change the principle of operation of a reference"; hence, the teachings of the references cited by the Office are not sufficient to render the claims prima facie obvious.

Additionally, Yamazaki does not teach a beam splitter, disposed on a path of said laser beam, splitting said laser beam into a first laser beam and a second laser beam. Instead,

Customer No.: 31561
Application No.: 10/709,055
Docket No.: 12404-US-PA

Yamazaki simply teaches a portion of a laser beam irradiates the front of a film, while another portion of the laser beam irradiates the back of the film.

Regarding Tanabe, Tanabe teaches the applications of a plurality of excimer lasers and a photomask to perform a plurality of irradiations on the same irradiated site, which is fundamentally different from the teachings of the instant case. As described in Figures 11-13, 15 and in col. 21, lines 1 to col. 22 line 35 of Tanabe, the master controller 3130 controls the laser controller 3113 to make the first and second lasers 3111 and 3112 to generate a pair of pulsed laser beams PL with a delay time of the set differential time t_1 . Both pulsed laser beams PL are superimposed via the composing optical system 3170 to yield a synchronizing pulsed laser beam for processing having a predetermined waveform, and the synchronizing pulsed laser beam is applied onto the substrate W. The reduction projection optical system 3121 converts the synchronizing pulsed laser beam into a beam having a target profile and energy density distribution and projects the processed beam onto the substrate W. In brief, Tanabe teaches the first and the second lasers 3111 and 3112 are superimposed to form the synchronizing pulsed beam, which is then converted into a beam to be projected onto the substrate W, while the present invention teaches separating two laser beams such that the regions irradiate by the first laser light do not overlap with the regions irradiate by the second laser light by the application of two photomasks, in which the transparent region and the non-transparent of one photomask are substantially aligned respectively with the non-transparent region and the transparent region of

Customer No.: 31561
Application No.: 10/709,055
Docket No.: 12404-US-PA

the other photomask. Accordingly, the motivation to modify Yamazaki by Tanabe to obtain the claimed invention is again lacking.

Applicant also respectfully disagrees with the Office's contention that "duplication of parts was held to have been obvious". The two photomasks of the invention are not just a simple duplication of one another. Instead, each photomask comprises a specific pattern that complements the pattern of the other photomask in order to achieve the effect of the invention. These features are neither suggested nor disclosed by the cite references.

In conclusion, "When prior art references require selective combination by the court to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gleaned from the invention itself (*Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1143 (Fed. Cir. 1985)). Applicants courteously remind the Office that it is inappropriate to simply engage in a hindsight reconstruction of the claimed invention.

In view of the foregoing, Applicants contend that the prior art cited by the Examiner, neither alone nor in combination explicitly teaches or implicitly suggests every element of claims 1 and 13. Applicants therefore respectfully request the withdrawal of the rejections under 35 U.S.C. § 103(a) of claims 1 and 13 and claims 2-12, 14-17 depending therefrom.

The Office Action rejected claims 6-11 and 13-17 under 35 U.S.C. 103(a), as being unpatentable over Yamazaki and Tanabe in view of Jung. Applicant respectfully traverses the rejections for at least the reasons set forth below.

Customer No.: 31561
Application No.: 10/709,055
Docket No.: 12404-US-PA

With regard to the 103 rejections of claims 6-11 by Yamazaki and Tanabe in view of Jung, Applicants respectfully submit that these claims defined over the prior art references for at least the reasons discussed above.

Jung teaches the application of a single mask and the crystallization of the different regions of the substrate is accomplished by moving the mask. Thus, Jung fails to teach the application of two photomasks in the optical paths of different laser beams to crystallize different regions. In brief, Jung teaches away the instant case.

Further, Jung is silent about emitting a second laser beam to a second region of the amorphous silicon film, after the amorphous silicon film in the first region is recrystallized. Jung has also failed to teach or suggest the transparent region and the non-transparent region of the first photomask substantially aligns with the non-transparent region and transparent region of the second photomask, respectively.

Accordingly, there is no teaching or suggestions to combine the prior art reference. Further, no combination from the prior art references can teach or suggest each and every element in claims 1 and 13. For at least these reasons, Applicant respectfully submits that independent claims 1 and 13 patently define over the prior art references, and should be allowed. For at least the same reasons, dependent claims 14-17 patently define over the prior art as a matter of law for at least the reason that these dependent claims contain all features of their dependent claims, respectively. Accordingly, favorable consideration and allowance of the present invention and all pending claims are hereby courteously requested.

Customer No.: 31561
Application No.: 10/709,055
Docket No.: 12404-US-PA

CONCLUSION

For at least the foregoing reasons, it is believed that the pending claims are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

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